

# **Mitigation and Monitoring Plan**

## **Prairie Creek Mitigation Site**

**US 31 Project in Hamilton County, Indiana  
Phase II; Segments 5 and 7**

**Primary Des. No. 0710215  
Mitigation Site Des. No. 1005580**

**Date: December 17, 2010**

**Prepared for:**



Indiana Department of Transportation  
100 N. Senate Avenue, I.G.C.N. 642  
Indianapolis, IN 46204-2216  
Phone: 317-232-5206  
Fax: 317-233-4929

**Submitted by:**



Union Station / 300 South Meridian Street  
Indianapolis, IN 46225  
Phone: 317-780-7182  
Fax: 317-788-0957  
Contact: Summer O'Brien, PWS

## Table of Contents

<b>1.0</b>	<b>Introduction.....</b>	<b>1</b>
<b>2.0</b>	<b>Baseline Information .....</b>	<b>1</b>
2.1	US 31 Hamilton County .....	1
2.2	Prairie Creek Mitigation Site .....	2
<b>3.0</b>	<b>Mitigation Goals and Objectives .....</b>	<b>3</b>
3.1	Functions Lost at Impact Site.....	3
3.2	Functions Gained at Mitigation Site .....	4
3.3	Watershed Improvements to be Gained .....	5
<b>4.0</b>	<b>Mitigation Site Selection and Justification .....</b>	<b>5</b>
4.1	Process of Site Selection .....	5
4.2	Likelihood of Success .....	6
4.3	Comparison of Gained and Lost Functions .....	6
<b>5.0</b>	<b>Mitigation Work Plan .....</b>	<b>6</b>
5.1	Design Expectations.....	7
5.2	Site Preparation and Sequence.....	7
5.3	Grading Plan.....	9
5.4	Planting Plan .....	10
5.5	Monitoring Wells .....	13
5.6	Signs.....	13
5.7	Existing Wetland Area Markers .....	13
5.8	As-Built Plans .....	13
<b>6.0</b>	<b>Performance Standards .....</b>	<b>13</b>
6.1	Yearly Target Success Criteria .....	13
6.2	Section 401/404 Final Success Criteria .....	14
<b>7.0</b>	<b>Site Protection and Maintenance.....</b>	<b>15</b>
7.1	Parties Responsible .....	15
7.2	Legal Protection .....	15
7.3	Maintenance Plan and Schedule .....	15
<b>8.0</b>	<b>Monitoring Plan .....</b>	<b>16</b>
8.1	Monitoring Schedule.....	16
8.2	Parties Responsible .....	17
8.3	Methodology .....	17
<b>9.0</b>	<b>Adaptive Management Plan .....</b>	<b>18</b>
9.1	Responsible Parties .....	18
9.2	Contingency Plan .....	18
9.3	Remedial Measures.....	18
<b>10.0</b>	<b>Financial Assurances.....</b>	<b>19</b>
10.1	Responsible Parties .....	19

## List of Appendices

Appendix A: Maps and Characterization Forms  
Appendix B: Photos  
Appendix C: Mitigation Drawings

## 1.0 Introduction

The existing US 31 will be upgraded to a controlled access freeway from I-465 to SR 38 in Hamilton County, Indiana. The project is 13.1 miles long within the Upper White River Watershed. All alternatives considered and associated environmental impacts are documented in the Environmental Impact Statement which can be reviewed at <http://us31hamiltoncounty.in.gov/public-records.html>. The wetlands and streams were delineated and recorded in the document *Ecological Survey Report for the US 31 Improvement Project (Des. No. 9905500) in Clay and Washington Townships, Indiana, Volume II* prepared by ASC Group, Inc dated March 7, 2008. The US 31 Project's wetland impacts are estimated at 4.31 acres and stream impacts are estimated at 12,093 feet. Mitigation recommended for wetlands is 8.39 acres and for stream is 9,129 feet of mitigation. However, the project will be permitted in phases since certain portions are scheduled to begin construction as early as February 2011 and other portions as late as 2017. Phase I was submitted for Segment 2 which includes the SR 38 Interchange, and Segment 5a which consists of the extension of a culvert under 146<sup>th</sup> Street. This submittal consists of Phase II; Segments 5 and 7 which extend approximately from US 31 and Rangeline Road to 156<sup>th</sup> Street. The entire recommended mitigation for the US 31 Project will be completed off-site at the Prairie Creek Mitigation Site except where on-site opportunities are available. The Phase II permit mitigation at Prairie Creek is identified separately in the mitigation plans. Mitigation for Phase II permit will consist of the stream and wetland restoration of the west field of the Prairie Creek Mitigation Site.

## 2.0 Baseline Information

### 2.1 US 31 Hamilton County

The US 31 project begins north of 96<sup>th</sup> Street and extends to south of 216<sup>th</sup> Street. Please reference the Construction Sequencing exhibit in the permit application for an overall view of the project and Segment locations. The segments contained in this permit application are as follows:

Table 2.1a: US 31 Segment Description

Segment	Des. No.	Description	RFC	Letting	Station Begin	Station End
5	600438	Rangeline and Keystone	6/09/2011	10/07/2011	531+90.00 "PR-K2"	585+00.00 "PR-K2"
7	900269	151st Street	3/16/2012	7/14/2012	585+00.00 "PR-K2"	644+00.00 "PR-K2"

A summary of streams and wetland impacts for Phase II permit application is provided below. Complete characterization forms and descriptions of all streams and wetlands are available in the above referenced report by ASC Group, Inc. 2008. Although 4,996 feet of stream will be impacted, existing structure lengths are subtracted from this number to provide a recommended mitigation length of 3,197 feet.

Table 2.1b: Stream Impacts For Segment 5 and 7

Site	Waterway name	Existing structure	Encapsulation	Riprap/ Fill	Relocation	Impact Length	New Structure or Impact Description
9	Tributary to Little Cool Creek	322lf 54" CMP	321lf	10lf	0	331lf	321lf 4'x10' RCP Box
10	Hiway Run	352lf twin 5'x4' Box	395lf	20lf	0	415lf	318lf 10x6 RCP Box, & 77lf RCP Box
11A	Cool Creek	(2) 36' 3-span Brg.	0	72lf	0	72lf	(2) 35lf 3-span bridges, riprap toe
12	Tributary to Cool Creek	0	60lf	20lf	480lf	560lf	Detention pond, base flow relocation, outlet pipe
13	Tributary to Cool Creek	252lf 5'x5' Box, 142lf 48"	2488lf	0	0	2488lf	48" storm sewer – 2720lf encapsulation, 480lf

		CMP					detention pond
14	Tributary to Cool Creek	303lf 24" RCP	292lf	11	0	303lf	21lf 24" pipe & 271lf 48" pipe
15	Tributary to Cool Creek	66lf 18" RCP	66lf	0	311	377lf	Relocation and 66lf 18" driveway pipe replacement
16	Tributary to Cool Creek	132lf 40' single span	0	235	0	235lf	150lf 77' twin Single span bridges, riprap toe
17	Tributary to Cool Creek	158lf 108" CMP/ 8' Box	0	215	0	215lf	170lf 24'x10' 3-sided culvert, riprap toe
	<b>TOTAL</b>	<b>1799lf</b>	<b>3622lf</b>	<b>583lf</b>	<b>791lf</b>	<b>4996lf</b>	

Table 2.1c: Jurisdictional Wetland Impacts For Segment 5 and 7

Site	Wetland Size (Acre)	Wetland Impact (Acre)	Type	Ratio	Fill (cys)	Recommended Mitigation (Acre)
22	0.03	0.03	PEME	2	48.40	0.06
22A	0.01	0.00	PEME	2	0.00	0.00
23	0.16	0.00	PFO1E	4	0.00	0.00
24	1.73	0.01	PSS1E	3	16.13	0.03
25	0.19	0.00	PEMH	2	0.00	0.00
26	0.10	0.00	PFO1E	4	0.00	0.00
27	0.06	0.00	PEME	2	0.00	0.00
28	0.02	0.02	PEME	2	32.27	0.04
29A	0.14	0.00	PEME	2	0.00	0.00
29B	0.56	0.00	PFO1E	4	0.00	0.00
30A	3.96	0.00	PFO1E	4	0.00	0.00
<b>Total</b>	<b>6.96</b>	<b>0.06</b>			<b>97</b>	<b>0.13</b>

## 2.2 Prairie Creek Mitigation Site

Located west of State Road 9 and east of Pendleton Avenue 1.1 miles south of I-69 exit 22 in Madison County, Indiana approximately 67 acres of farm ground is being purchased by INDOT for mitigation in the Upper White River watershed (Appendix A, Maps). The property contains approximately 42.3 acres of hydric soils in the floodplain of Prairie Creek and 3,100 feet of stream frontage. A very narrow, almost non-existent riparian corridor is present along the creek consisting mainly of box elder trees. Approximately 25 acres of the property adjacent to Prairie Creek are farmed (Appendix B, Photos). The soil for this farmed area is Mahalasville silty clay loam, a very poorly drained soil. Tiles are located throughout the west field. A total of 17.36 acres of the property was delineated as existing wetland with the east field comprising 16.24 acres of wetland<sup>i</sup>. The wetland delineation for this site was submitted to IDEM and USACE on May 10, 2010 and includes FQA and QHEI forms for the proposed mitigation site. The east field is dominated by cattails and reed canary grass.

The property is located at UTM coordinates 607990m E 4430871m N (NAD83) in the Anderson South, Indiana 7.5 Minute USGS Quadrangle Map Sections 9 and 16, Township 18 N, Range 7 E. Prairie Creek is listed on the IDEM Section 303d list for *E. coli*. Prairie Creek is a Legal Drain in Madison County and has been straightened to facilitate drainage. The mitigation site in Madison County, Indiana is located in the Loamy, High Lime Till Plains section of the Eastern Corn Belt Plains, an ecoregion characterized historically by natural fertility, forests, and swamp forests. Historically, the forests were generally dominated by beech, oak, and sugar maples. Swamp forests were characterized by elm and ash.

### 3.0 Mitigation Goals and Objectives

The goals of the mitigation are to provide equal or greater function and value than that being lost by the proposed construction. It is anticipated that target functions and values for the mitigation site may be achieved within a 3 to 5 year time frame, including flood storage and wildlife use; however, woody species will require a longer time frame to achieve their functions. Complete habitat replacement may take 20 to 30 or more years for woody species to mature, therefore, a higher replacement ratio is required for this type of impact.

#### 3.1 Functions Lost at Impact Site

All potential impact sites were assessed for function and value using the Qualitative Habitat Evaluation Index (QHEI), Headwater Habitat Evaluation Index (HHEI), Isolated Classification Worksheet, Fish and Macroinvertebrate Sampling, and/or Indiana Wetlands Rapid Assessment Protocol (InWRAP) where applicable in November 2007 through February 2008 and May 2008. The previously referenced report by ASC Group, Inc. 2008 and also the *Addendum to Ecological Survey Report* by ASC Group, Inc. dated June 20, 2008 contains all data forms and tables. The following table depicts stream impacts by stream classification. Streams assessed as Class I, II, or III are Primary Headwater Habitat (PHWH) streams with a watershed of less than 1 square mile. Streams with watersheds greater than 1 square mile are described as very poor, poor, fair, good, and excellent based upon the Ohio EPA QHEI scoring.

Table 3.1a: Stream Functions Lost For Segment 5 and 7

Site	Waterway name	Type	Class	Width at OHWM (ft)	Depth (ft)	Mitigation Recommended (ft)
9	Tributary to Little Cool Creek	Intermittent	Modified Class II	4.6	0.29	9
10	Hiway Run	Intermittent	Poor	7	1.25	63
11A	Cool Creek	Perennial	Fair	20	4	0
12	Tributary to Cool Creek	Intermittent	Modified Class II	4.6	0.5	560
13	Tributary to Cool Creek	Intermittent	Modified Class II	4.3	0.56	2094
14	Tributary to Cool Creek	Intermittent	Modified Class II	3.3	0.82	0
15	Tributary to Cool Creek	Ephemeral	Class I	3.3	0.1	311
16	Tributary to Cool Creek	Perennial	Poor	16	3	103
17	Tributary to Cool Creek	Perennial	Poor	13	2.5	57
<b>TOTAL</b>						<b>3197</b>

Sites 9, 10, 11A, 14, 16 and 17 are existing stream crossings that will be replaced with similar structures. No significant effects to wildlife or water quality functions are expected to result from these construction activities. Site 12 is located in between the Keystone north and southbound ramps to US 31 from a pipe that collects highway runoff. It will be impacted mainly by the excavation of a dry detention basin that will create a wider floodplain area and relocation of the base flow channel. Wildlife and water quality functions are not expected to be adversely affected due to the current urban environment. Site 13 is located along US 31, beginning at a pipe outlet just southwest of Greyhound Pass and crosses US 31 to the east and continues south to Cool Creek. The encapsulation of most of this stream length will eliminate any urban wildlife function it provides. The encapsulated stream will eventually be diverted through a series of dry detention basins in the US 31 – Keystone interchange system for water quality/quantity improvements prior to outletting to Cool Creek. Site 15 consists of an ephemeral channel bed that runs through a lightly forested residential/business property prior to opening up into wetland site 29A. A new driveway access will be constructed which will divert the water flow.

The following table depicts wetland impacts by functional type and recommended mitigation values. Dominant vegetation type and landscape position are two standard indicators of a wetland's function potential.

Table 3.1b: Wetland Functions Lost For Segment 5 and 7

Totals	Type	Impact (Acre)	Ratio	Recommended Mitigation (Acre)
<b>Jurisdictional</b>	Forested	0.00	4	0.00
	Scrub shrub	0.01	3	0.03
	Emergent	0.05	2	0.10
	Open Water	0.00	1	0.00
	<b>Total</b>	<b>0.06</b>		<b>0.13</b>
<b>Isolated</b>	n/a	0.00	0	0.00
	<b>Total</b>	<b>0.00</b>		<b>0.00</b>

Wetland 22 is dominated by narrow leaved cattail and is regularly impacted by human activities such as mowing, road runoff, and no natural buffer. Wetland 24 is a large higher quality wetland with vegetative diversity however it is isolated from other natural features by highways and development. Wetland 28 is of moderate quality with adjacent vegetative buffers however it is located in the gas line easement and is impacted by maintenance activities regularly. Wetlands 22A, 23, 25, 26, 27, 29, and 30A were avoided by the use of retaining walls or other road design efforts. Only a small portion of wetland will be impacted so function is not expected to be adversely affected by the project.

### 3.2 Functions Gained at Mitigation Site

The impacts shown in Table 3.1a will be replaced at a 1:1 ratio for 3,197 feet of mitigation required. This length is available at the Prairie Creek Mitigation site (Appendix C, Mitigation Plans). This number was reached by adding up all impacts and subtracting existing structure lengths.

The Phase II mitigation includes the creation of two ephemeral tributaries by day-lighting existing farm tiles and meandering them in a natural pattern and 2,400 feet of intermittent/perennial stream adjacent to and west of Prairie Creek. The outflow will be connected to the existing Prairie Creek by a low water crossing lined with articulating concrete mat. The stream mitigation will be buffered by 7.46 acres of forest. The additional 112 feet and 0.26 acre buffer will be constructed as contingency. The stream mitigation is summarized in Table 3.2a.

Table 3.2a: Proposed Stream Mitigation at Prairie Creek

Stream Mitigation	Feet	Acre	Potential HHEI Class
Stream A	2400	5.51	Modified Class II
Tributary E	408		Modified Class I or II
Tributary F	501	1.95	Modified Class I or II
<b>Total</b>	<b>3309</b>	<b>7.46</b>	

The QHEI score for the existing Prairie Creek is 30.5 along Reach 1 (Appendix A) and 49 along Reach 2 (Mikles, 2010). A total length of 3,309 feet will be created with a potential to match, if not exceed, the existing Reach 2 score on the Phase II reach of Stream A. The drainage area will be less than 1 sq mi, therefore this anticipated QHEI score is only shown to provide a reference for design.

A total of 0.13 acre wetland mitigation is required as indicated by Table 3.1b. The wetland mitigation will be constructed at Prairie Creek site through the expansion of the existing wetland 3. A low berm will be placed along the southern boundary of the proposed wetland limits which will retain seasonal

shallow water. The existing wetland portion will be managed for invasive species as part of the mitigation site management plan.

### *3.3 Watershed Improvements to be Gained*

The Prairie Creek mitigation site lies within the Geist Reservoir – Fall Creek 10 digit HUC (hydrologic unit code) watershed, 0512020108. This watershed is of much concern as Geist Reservoir lies within this watershed. Geist Reservoir is not only a recreational area, but also a public drinking water supply reservoir to the City of Indianapolis and has recently become a concern due to serious blue-green algae blooms. Blue-green algae can be toxic and affects the taste and odor of water. Contact with blue-green algae can cause skin irritations and consumption of untreated water can cause gastrointestinal sickness. The blue-green algae are bacteria which occur in a broad range of water bodies. The algae “bloom” when temperature and water conditions are right, typically during the months of May to October. There are a number of factors that help algal growth. The factors include sunlight, warm weather, low water turbulence, and nutrient sources. Nutrient sources include phosphorus and nitrogen, which are commonly applied to lawns and agricultural fields to aide in the growth and development of plants. The nutrients, however, often leach through soils into tile drains or runoff directly into ditches or streams, especially if applied prior to a heavy rain event. The nutrients are then carried by the streams and ditches to lake and reservoirs. The increase of nutrients, along with the other factors, provides the right mix for the algae to bloom.

The recent significant outbreaks of the blue-green algae in the Geist Reservoir – Fall Creek watershed have led to a number of concerned citizens and local stakeholders working together to improve water quality in the watershed. The groups have identified several areas in the watershed that may have a disproportional impact on water quality. However, any areas where improvements can be made to better water quality are a step in the right direction. The creation of the Prairie Creek mitigation site would work to improve water quality in the greater Geist Reservoir – Fall Creek watershed.

Prairie Creek is upstream of Geist Reservoir where a number of the blue-green algae concerns are occurring. Prairie Creek feeds into Fall Creek. Fall Creek is the primary stream input into Geist Reservoir. By creating a riparian buffer to Prairie Creek and expanding wetlands, nutrients will be filtered by the vegetation before entering Prairie Creek. The creation of mitigation sites will also enhance the diversity of habitats available and reduce sediment loading within streams by restoring floodplains to their historic function.

## **4.0 Mitigation Site Selection and Justification**

### *4.1 Process of Site Selection*

Conceptual mitigation sites were identified in the EIS for potential wetland mitigation in the Upper White River Watershed 8-digit HUC 05120201. In addition to following up on these sites, additional searches occurred through local contacts. Since significant stream mitigation was needed, a site that could provide both wetland and stream restoration opportunities was sought. Contacts with local watershed coordinators led to a meeting with the Town of Pendleton. The Town is working toward meeting the Rule 13 stormwater regulations and have identified stormwater treatment wetlands as an opportunity to improve water quality. Since mitigation wetlands cannot serve to treat stormwater directly, we looked into properties where flood storage and native vegetation restoration would provide water quality benefits to the Town and greater watershed. The Prairie Creek site was listed for sale and field investigations verified that the site would be suitable for significant mitigation opportunities. The Prairie Creek site is also large enough to accommodate all of the mitigation needed for the US 31 project. One site, versus many, reduces the effort of coordination, management, scheduling, and costs. Securing a mitigation site requires property owner coordination, agency approval, wetland delineations, archaeology reviews, topographic survey, hydrology assessment, soil assessment, appraisals, and construction plans. Securing one large site reduces costs associated with securing mitigation, preparing

construction plans, construction, maintenance, monitoring, etc. Fewer mitigation sites associated with the US 31 project also reduces permit management efforts of INDOT, IDEM, USACE, and other involved agencies.

Additional sites were identified through local city/town planners in which the US 31 project runs, however land costs and regulated drain easements reduce the viability of mitigation opportunities through the corridor. Several sites have been identified as back-up in the event that additional mitigation is needed. The chosen mitigation site at Prairie Creek exhibited the highest possibility of success out of all the potential options available because of the soil types, sources of hydrology, current land use, purchase and construction cost, and site control.

#### *4.2 Likelihood of Success*

A total of 9,129 feet of stream mitigation will be constructed at the Prairie Creek mitigation site for the entire US 31 Hamilton County project. Each Phase of the mitigation plan can be constructed separately and function separately. However, once the entire site is complete, the overall plan will work together as one cohesive ecosystem providing a greater benefit than the individual projects alone. In Phase III, the intermittent/perennial channel will be lengthened at the northern end tying in to the existing Prairie Creek, creating a meandering overflow channel. The west stream bank of existing Prairie Creek, a regulated drainage easement, is not offered as mitigation however it will be removed from farming activities and planted in grasses to provide a filter strip buffer width of 75 feet. The Prairie Creek Mitigation Site is expected to be successful because it contains many opportunities for wetland and stream improvements. Adjacent properties exhibit many of the characteristics that this design seeks to achieve.

The mitigation site will be constructed as a higher quality habitat than that being impacted. This will ensure that the minimum success criteria are met at the end of the typical monitoring period even with potential low plant survivability rates. A contingency has been added to the construction in the event that drought, flooding, or other potential disaster negatively impacts the wetland or stream development. The planting plans were also based upon historical accounts of native vegetation and nearby reference sites. This will ensure that the establishment of vegetation will be successful. Potential drawbacks to the success of the mitigation sites will be the control of invasive species and legal drain maintenance and is addressed later in this document.

#### *4.3 Comparison of Gained and Lost Functions*

The application of mitigation ratios based upon type of wetland to be created will improve the likelihood that the project will not result in a net loss of wetland or stream. A total of 0.06 acres of wetland will be impacted therefore the restoration of 0.13 acres of wetland is recommended as suitable to compensate for the lost functions. New stream encapsulation, relocation, and riprap fill impacts total 3,197 feet therefore the creation/restoration of 3,197 feet of stream is recommended as suitable to compensate for the lost functions. Recommended mitigation ratios were established in a MOU between INDOT and the IDNR and USFWS in 1991 and through additional recommendations by IDEM and USACE on May 10, 2010.

### **5.0 Mitigation Work Plan**

All mitigation will be constructed concurrently with the US 31 Improvement project and will be completed within two years of the approved permit. Phase II permit submittal consists of Segments 5 and 7, with the letting of Segment 5 scheduled for October 7, 2011. Mitigation for this Phase II permit submittal consists of construction of the stream and wetland in the west field (Appendix C, Mitigation Plans). The east field mitigation in Phase I was described in a separate Mitigation and Monitoring Plan document.



### *5.1 Design Expectations*

Construction and plant installation will be supervised by RW Armstrong, or other designated agent of INDOT, to ensure that the mitigation is constructed as designed. All construction will occur in a manner consistent with the mitigation goals and be recorded in as-built plans. The mitigation areas constructed for the US 31 Hamilton County Improvement Project will be permanently and clearly marked following construction. If the mitigation is established adjacent to or near existing wetlands or streams, permanent stakes/markers will distinguish the boundaries.

#### 5.1.1 Sensitive Areas

A Phase 1a Archaeological Field Reconnaissance<sup>ii</sup> and Historic Property Report<sup>iii</sup> were completed for the mitigation site. All activities within designated sensitive areas are prohibited unless prior approval is granted by the State Historic Preservation Officer. If a sensitive area is present within the work area, it will be marked on plans for avoidance.

A wetland delineation was completed for the mitigation site. The identified existing wetland areas will not be filled or dredged and will be protected during construction. They may be treated for invasive species, planted with native species, and protected from future development under the approved permits.

#### 5.1.2 Stream Crossings

A farm ditch crossing exists at the north end of Prairie Creek on the property which may or may not be suitable for construction equipment access. Any modifications to this crossing or the installation of other crossings on Prairie Creek are not covered by this application and must be properly permitted.

### *5.2 Site Preparation and Sequence*

The sequencing of mitigation site construction is extremely important for a successful project. All applicable permits will be displayed at the construction site. Farming activities will continue on the west field until phase II permits have been submitted and approved.

#### 5.2.1 Temporary Erosion Control Measures

The construction entrance will be installed on the access easement on Pendleton Ave adjacent to the railroad. Prior to the initiation of grading activities, silt fence will be installed along the perimeter of the grading limits. All existing wetlands, ditches, and other sensitive areas will also be protected by silt fence during construction. Additional measures outlined in the erosion control plan and stormwater pollution prevention plan (SWPPP) shall be followed. Removal of silt fence and other temporary erosion control measures shall occur following successful seed germination at the completion of the project. All disturbed slopes steeper than 20 percent grade will be stabilized with erosion control blanket following seed installation. Slopes of this grade are designed along the stream banks.

#### 5.2.2 Invasive Species Treatment

Prior to the initiation of grading activities, the site shall be inspected for reed canary grass and treated with herbicide and/or other approved removal method. Active management will be necessary to prevent the spread of reed canary grass. Regular treatment of this area shall occur until success criteria are met and the site is released from monitoring by the permitting agencies. Grading, native seeding and tree planting may commence within a week of the last herbicide treatment. The herbicide of choice is Rodeo (Glyphosate). Rodeo is a formulation of glyphosate specifically designed for use in wet habitats. Rodeo should be applied following the manufacturer's directions and include a tracer dye.

#### 5.2.3 Invasive Species Prevention

The introduction and establishment of invasive species must be minimized through the use of the following protocols;

- Thoroughly clean field clothes, boots, equipment, machinery, and other tools during construction, monitoring, and maintenance events between mitigation sites, areas within the mitigation sites, and other projects,
- Sequence events so that un-infested areas are completed prior to working in infested areas,
- Locate and use weed-free project staging areas,
- Avoid or minimize all types of travel through weed-infested areas and regulate flow of traffic on site,
- Treat adjacent areas of invasive species to reduce the likelihood of spreading,
- Inspect material sources, including gravel, soil, etc., prior to use and/or transport,
- Minimize soil disturbance to the extent practical to avoid creating soil conditions that promote weed germination,
- Always use native plant materials of local genotype,
- Use weed-free straw or mulch,
- Provide training to construction, monitoring, and maintenance crews on the weed prevention protocols<sup>1</sup>.

#### 5.2.4 Soil

The soils occurring at the mitigation site include 68.7 acres of hydric soils made up of 2.8 acres of very poorly drained Palms muck and 65.9 acres of poorly drained soils including the Mahalasville silty clay loam series. The non-hydric, moderately well-drained Miami soils and the somewhat poorly drained Sleeth silt loam series make up the remaining 1.4 acres of the site (Table 5.2.4). No soil amendments are proposed.

Table 5.2.4; Mitigation Site Soils

Soil Name	Hydric	Drainage Rating	Flooding/ Ponding	Depth to Water Table
Palms muck (Lm)	Yes	Very Poorly Drained	Yes	<3 inches
Mahalasville silty clay loam (Ml)	Yes	Poorly Drained	Yes	6 inches
Mahalasville silty clay loam (Mm)	Yes	Poorly Drained	Yes	6 inches
Miami soils (MpD3)	No	Moderately Well Drained	No	2 feet +
Sleeth silt loam (Sl)	No	Somewhat Poorly Drained	No	1 foot +

The Palms series consist of very deep, very poorly drained soils formed in herbaceous organic material. Marsh vegetation of grasses, reeds, sedges, alder, aspen, willow, and dogwood make up most of this soils area. Palm soils are typically used for watershed protection, recreation, research, and wildlife habitat. Some areas have been drained and are used for pasture, corn, and some truck crops. In Indiana, Palms muck is farmland of statewide importance.

The Mahalasville series consists of very deep, poorly drained and very poorly drained soils that formed in loess or other silty material and in the underlying loamy and sandy outwash. These soils are prime farmland if drained and most are cultivated. Principal agronomic crops include alfalfa, clover, corn, soybeans, and wheat. Forests of ash, elm, and maple, with areas of swamp grasses defined the native vegetation of the Mahalasville series.

<sup>1</sup> USDA Forest Service Guide to Noxious Weed Prevention Practices, Version 1.0, Dated July 5, 2001

The Miami series consists of very deep, moderately well drained soils that are moderately deep to dense till. Most areas are used to grow corn, soybeans, small grain, and hay; however, it is not classified as prime farmland. Permanent pasture or forested areas characterize much of the sloping areas. Deciduous forests comprise Miami soils native vegetation.

The Sleeth series consists of very deep, somewhat poorly drained soils that are deep to calcareous, stratified gravelly and sandy outwash. Sleeth soils are prime farmland if drained and most are cultivated to grow corn, soybeans, and small grains (mostly wheat). Deciduous forests comprise Sleeth soils native vegetation.

#### 5.2.5 Hydrology

The Prairie Creek mitigation area is located in the 100 year floodplain zone A3 and B, and outside the floodplain in zone C as shown on the Flood Insurance Rate Map (FIRM) community panel number 1801560004C effective May 3, 1982. A flood cross section elevation reveals that the 100 year flood reaches between elevations 850 and 849 on the site in zone A3, and zone B where depths may be less than one foot. Most of the site is currently 850 or lower and will be subject to flood events. Prairie Creek drains a watershed of 13.6 square miles from the center of the mitigation site. Stream flows, obtained from the USGS StreamStats website, are listed in Table 5.2.5 for the 10 year, 25 year, 50 year, and 100 year events.

Table 5.2.6; Stream Flows at Prairie Creek

Statistic	Flow (ft <sup>3</sup> /s)
Q10	1500
Q25	1830
Q50	2220
Q100	2580

The majority of the mitigation site is mapped as Mahalasville soil which has an upper water table limit at the surface from December to May and frequent ponding depths up to 0.5 feet above the ground surface. The site is extensively tiled which lowers the water table and increases the rate at which the site drains. The tiles will be located and crushed in place or removed. Ephemeral stream channels will be created in the shallow valleys in the general location of tiles. The channels will convey flows that would otherwise been conveyed by tiles, however the channel substrate, meanders, and native vegetation will reduce the volume and discharge rate. An intermittent channel will be created that will receive backwater flows from Prairie Creek during flood events, will convey the flow from the ephemeral channels to Prairie Creek, and will also intercept the water table in normal years. These hydrology inputs will impress an ordinary high water mark over time due to the fluctuating water levels. A 10 foot wide base channel will be constructed however the water levels are expected to scour a low flow channel narrower than 10 feet in some areas and up to 15 feet in other areas creating a riffle pool sequence.

#### 5.3 Grading Plan

The existing cattle fences shall be removed. A new fence will be installed along the new parcel limits and a gate installed at the access easement as show on plans. The site will be graded to the elevations and dimensions shown on the Mitigation Plan. Stream A will have a profile slope of approximately 1 percent and a typical base width of 10 feet. Side slopes will be 3:1 for a depth of 1.5 feet and 6:1 to tie into existing grade. The total length will be a sinuous 2,400 feet with a low water crossing through the drainage easement where it meets the existing stream channel. The ephemeral tributaries will have varying profile slopes with a typical base width of 5 feet. The profile slopes are very shallow and meander through wetland complexes, therefore they will exhibit intermittent slow flows. The constructed streams will have a riffle pool complex structure in some areas to provide amphibian and macroinvertebrate habitat. Specific beneficial habitats in the muckier stream areas would consist of overhanging vegetation, rootmats, rootwads, oxbows, aquatic macrophytes, logs and woody debris of

high quality and moderate to frequent amounts. Cross sections for the proposed stream mitigation have been included in the attached mitigation plans.

The existing Prairie Creek stream channel will not be altered. A width of 75 feet from the west bank will remain free of excavation activities, planted trees, and shrubs to allow for routine regulated drain maintenance if needed. The outlet for the constructed stream channel through the easement will consist of rip rap or articulated concrete mat such that it can be used similar to a low water crossing structure. The elevation of the outlet structure will be set at an elevation near the existing Prairie Creek ordinary water elevation.

#### 5.4 Planting Plan

Mitigation plant species will include a combination of seed, bare root seedlings, and 3 gallon containers. All plant material will be purchased from a nursery that is "Yellow Tag" certified by the Indiana Crop Improvement Association, the governing body that insures that all native materials are obtained within the designated and appropriate ecoregion. The INDOT Ecology and Permitting Section shall be notified of any changes in material and recorded in the as-built plan. Only native plants listed in the Mitigation Plan shall be planted unless prior approval is granted. Alternatives will be substituted based on availability by Indicator. C values have been provided for qualitative reference.

All material will be shipped and stored according to industry standard practices. Seeds will be purchased in their recommended mixes for specific conditions. All seed mixes include a temporary cover crop of seed oats (*Avena sativa*) and annual rye (*Lolium multiflorum*). No special removal methodology of these two annual species is anticipated. Trees and shrubs will be specified as either conservation grade bare-root seedlings or 3 gallon containers. Seedlings are 12-36 inch trees or shrubs and are typically purchased in bundles of 25.

The wetland indicator status for all species is provided. The wetland indicator represents the estimated probability of a species occurring in a wetland. The categories are defined as follows:

- Obligate Wetland (OBL) – almost always occurs (>99%) in wetlands
- Facultative Wetland (FACW) – usually occurs (67-99%) in wetlands
- Facultative (FAC) – equally likely to occur in both wetlands (34-66%) and non-wetlands
- Facultative Upland (FACU) – unlikely to occur (1-33%) in wetlands
- Obligate Upland (UPL) – occurs in wetlands in other regions but not in the region specified

##### 5.4.1 Seeding

Installation of seed will occur between October 1 and July 1. Any large obstructions (logs, rocks, trash) will be removed from the seeding area prior to seed installation. Any germination of existing species prior to planting will be controlled using a glyphosate herbicide. The approved seed mix will be installed using equipment designed for the installation of native seed (no-till drill or equivalent) to allow for the appropriate depth placement of the seed or broadcast. Seed shall be placed at a depth no greater than 1/4 inch. A cover crop consisting of seed oats and annual rye will be installed to provide initial erosion control and reduce the potential competition from invasive species. Planting zones are detailed in the Mitigation Plans.

The wooded wetland establishment seed mix area is 16.32 acres, including 7.46 acres riparian buffer, 0.44 acre wetland creation, 0.96 acre wetland preservation, and 7.46 acres additional buffer. Table 5.4.1a provides the species mix, their indicator status, and the ounces per acre of each.

Table 5.4.1a; Wooded Wetland Establishment Seed Mix (PFO1A/PFO1E).

Botanical Name	Common Name	PLS Oz/Acre	Indicator Status
<b>Permanent Grasses/Sedges:</b>			
<i>Calamagrostis canadensis</i>	Bluejoint Grass	1.00	OBL
<i>Carex crinita</i>	Fringed Sedge	2.00	FACW
<i>Carex lupulina</i>	Common Hop Sedge	4.00	OBL
<i>Carex lurida</i>	Bottlebrush Sedge	1.50	OBL
<i>Carex frankii</i>	Bristly Cattail Sedge	3.00	OBL
<i>Carex squarrosa</i>	Narrow-Leaved Cattail Sedge	1.00	OBL
<i>Carex typhina</i>	Common Cattail Sedge	1.00	OBL
<i>Carex vulpinoidea</i>	Brown Fox Sedge	4.00	OBL
<i>Elymus virginicus</i>	Virginia Wild Rye	20.00	FACW
<i>Glyceria striata</i>	Fowl Manna Grass	2.00	OBL
<i>Leersia oryzoides</i>	Rice Cut Grass	2.00	OBL
<i>Scirpus atrovirens</i>	Dark Green Rush	2.00	OBL
<i>Spartina pectinata</i>	Prairie Cord Grass	1.00	FACW
	<b>Total</b>	<b>44.50</b>	
<b>Temporary Cover:</b>			
<i>Avena sativa</i>	Common Oat	360.00	NI
<i>Lolium multiflorum</i>	Annual Rye	100.00	NI
	<b>Total</b>	<b>460.00</b>	
<b>Forbs:</b>			
<i>Alisma</i> spp.	Water Plantain (Various Mix)	3.00	OBL
<i>Angelica atropurpurea</i>	Great Angelica	1.00	OBL
<i>Aster puniceus</i>	Bristly Aster	0.75	OBL
<i>Aster umbellatus</i>	Flat-Top Aster	0.25	FACW
<i>Bidens cernua</i>	Nodding Bur Marigold	2.50	OBL
<i>Campanula americana</i>	Tall Bellflower	0.25	FAC
<i>Cephalanthus occidentalis</i>	Buttonbush	0.50	OBL
<i>Helenium autumnale</i>	Sneezeweed	2.00	FACW
<i>Heracleum lanatum</i>	Cow Parsnip	0.75	FACW
<i>Hibiscus moscheutos</i>	Swamp Rose Mallow	2.00	OBL
<i>Lobelia siphilitica</i>	Great Blue Lobelia	1.50	FACW
<i>Lycopus americanus</i>	Common Water Horehound	0.25	OBL
<i>Mimulus ringens</i>	Monkey Flower	1.25	OBL
<i>Penthorum sedoides</i>	Ditch Stonecrop	0.50	OBL
<i>Polygonum</i> spp.	Pinkweed (Various Mix)	0.50	OBL
<i>Rudbeckia laciniata</i>	Wild Golden Glow	0.75	FACW
<i>Verbesina alternifolia</i>	Wingstem	2.00	FACW
	<b>Total</b>	<b>19.75</b>	

The filter strip seed mix area is 2.93 acres within the county easement. Table 5.4.1b provides the species mix, their indicator status, and the ounces per acre of each.

Table 5.4.1b; Filter Strip Seed Mix

Botanical Name	Common Name	PLS Oz/Acre	Indicator Status
<i>Elymus virginicus</i>	Virginia Wild Rye	32.00	FACW

<i>Panicum virgatum</i>	Switchgrass	6.00	FAC
	<b>Total</b>	<b>38.00</b>	

#### 5.4.2 Tree and shrub installation

Tree installation will occur after September 15 until the first frost, or between March 15 and June 1. Trees and shrubs will be inspected for health at arrival and kept moist until installation. Trees and shrubs shall be planted in the designated planting zones at 10 feet on-center for seedlings and shrubs and 15 feet on-center for 3 gallon tree containers. The tree to shrub planting ratio shall be 2 trees per 1 shrub. The planting hole should be dug two times wider and equal depth as the container. The root flare should be visible above soil grade. The tree shall be level and the hole backfilled with native soil and tamped lightly. The tree should be watered thoroughly. The tree should be staked only when necessary and stakes shall be removed after one year. Each tree and shrub will be treated with an application of deer/rodent repellent. Planting zones are provided in plan view in the Mitigation Plan.

At the Prairie Creek mitigation site, the constructed wetland area will be planted with 10 shrub seedlings and 4 3-gallon container shrubs on 0.03 acre for the shrub requirement. The stream channel buffer will be planted with 1,741 tree seedlings, 193 3-gallon container trees, 858 shrub seedlings, 95 3-gallon container shrubs, on 7.46 acres. No less than 6 species of trees and 6 species of shrubs shall be planted. No single species shall constitute more than 20 percent of the total. Each species shall be evenly distributed throughout the planting area. The container plants shall be evenly distributed throughout the planting area.

Table 5.4.2a; Prairie Creek Mitigation Species

#### Trees

<b>Scientific Name</b>	<b>Common Name</b>	<b>Indicator</b>	<b>C value</b>
<i>Acer rubrum</i>	Red Maple	FAC	5
<i>Alnus serrulata</i>	Smooth Alder	OBL	6
<i>Betula nigra</i>	River Birch	FACW	2
<i>Carya laciniosa</i>	Shellbark Hickory	FACW	8
<i>Crataegus viridis</i>	Green Hawthorn	FACW	7
<i>Liquidambar styraciflua</i>	Sweetgum	FACW	4
<i>Nyssa sylvatica</i>	Black gum	FAC	5
<i>Platanus occidentalis</i>	American Sycamore	FACW	3
<i>Quercus bicolor</i>	Swamp White Oak	FACW	7
<i>Quercus palustris</i>	Pin Oak	FACW	3

#### Shrubs

<i>Amorpha fruticosa</i>	Shrub Indigo	FACW	3
<i>Aronia melanocarpa</i>	Black Chokeberry	FACW	8
<i>Cephalanthus occidentalis</i>	Buttonbush	OBL	5
<i>Cornus amomum</i>	Silky Dogwood	FACW	10
<i>Cornus sericea (stolonifera)</i>	Red-Osier Dogwood	FACW	4
<i>Decodon verticillatus</i>	Water Willow	OBL	8
<i>Ilex verticillata</i>	Winterberry	FACW	8
<i>Sambucus canadensis</i>	Elderberry	FACW	2
<i>Spiraea alba</i>	White Meadowsweet	FACW	4
<i>Viburnum trilobum</i>	Highbush Cranberry	FACW	10

### 5.5 Monitoring Wells

A minimum of 1 monitoring well will be installed in the wetland mitigation area. The well should be constructed according to the USACE recommended standards for wetland monitoring. An automatic data logger shall record daily water levels.

### 5.6 Signs

A minimum of 19 signs indicating "Do Not Mow or Spray" shall be placed around the mitigation area, including buffers and along the Prairie Creek Drain easement.

### 5.7 Existing Wetland Area Markers

Existing wetland boundaries shall be marked with permanent stakes or other marker for the purposes of determining final mitigation values.

### 5.8 As-Built Plans

As-Built plans will be submitted to the USACE and IDEM with the first year monitoring report. Construction Plans shall be included with an itemized list of materials purchased. If the site was not constructed to plan, any deviations from the approved construction plan will be discussed including substitute plant materials.

## 6.0 Performance Standards

### 6.1 Yearly Target Success Criteria

Yearly forested or shrub survival rates will be measured to determine if additional planting or other corrective actions would be needed to meet the final success criteria. This information provides guidance for planning purposes only and does not constitute regulatory requirements. Typical survival rates for stock planted trees and shrubs are as follows<sup>2</sup>:

- Approximately 75% alive and growing in year 4 of monitoring
- Approximately 50% alive and growing in year 6 of monitoring, height doubled
- Approximately 41% alive and growing in year 8 of monitoring
- Approximately 33% alive and growing in year 10 of monitoring

If the survival rates are not met in any given year, or if the differences in targeted acreage are greater than 5%, corrective action may be necessary to meet the final success criteria density. No single species shall constitute more than 20 percent of the total; therefore, at least 5 out of 6 of the planted tree and shrub species shall be present in the final year. The presence of significant numbers of healthy hydrophytic volunteers will indicate suitable wetland conditions and a portion may be counted toward final required plant densities.

Expected surface area coverage of native hydrophytic vegetation in the wetland communities should be 50% after three years. Diversity index scores shall be stable or increasing in the two years before final acceptance of the mitigation.

Hydrology will be measured in monitoring years 2 through 4, 6, 8, and 10 through observation of primary indicators. The wetlands must exhibit primary indicators of hydrology more years than not.

Volunteer native species are expected and would include the typical pioneering species like cottonwood (*Populus deltoides*), green ash (*Fraxinus pennsylvanica*), willow species (*salix* spp.), soft rush (*Juncus effusus*), Bristly cattail sedge (*Carex frankii*), and awl-fruited oval sedge (*Carex tribuloides*). Invasive

<sup>2</sup> <http://www.sas.usace.army.mil/APDX%20G%20Success%20Criteria.pdf>

species like cattail (*Typha latifolia*) and reed canary grass (*Phalaris arundinacea*) are also expected as volunteers. Management of these invasive species is discussed separately in this report.

## 6.2 Section 401/404 Final Success Criteria

The mitigation will exhibit or exceed the minimum performance standards set forth and will determine completion of the mitigation responsibilities. Habitat types, functions, and values will be evaluated for progress in relation to the mitigation goals. The success criteria below is only applicable to the Phase II permit application submittal.

The wetland mitigation must meet the following success criteria for at least two consecutive years:

- The area of the wetland must meet or exceed the area of mitigation required, as measured by a wetland delineation.
  - The Mitigation Site must have a minimum wetland credit of 0.13 acres. This shall not detract from the stream buffer area requirement or existing wetland. If necessary, the total wetland on the Phase II portion of the mitigation site will be delineated and areas that fall within the 50 foot stream buffer shall be subtracted from the total.
  - Greater than 50 percent of the dominant vegetation species must have a wetland indicator of FAC or wetter.
  - The hydrology must meet the wetland hydrology criteria contained in the USACE Wetland Delineation Manual 1987 in more years than not.
- The class and type of wetland established must meet or exceed the class or type required unless otherwise approved by the USACE or IDEM. Class may include rare and ecologically important types, Cowardin class, and/or IDEM isolated class 1, 2, or 3.
  - The Site must have a minimum of 0.03 acres of scrub shrub wetland credit and 0.10 acres of emergent wetland credit. The emergent wetland credit may be of higher eco-type such as shrub or forested.
- The combined surface areal coverage of *Phalaris arundinacea* and *Typha* spp. shall not exceed 15 percent of the mitigation wetland.
- The wetland must be free of *Lythrum salicaria*, *Phragmites australis*, *Rhamnus frangula*, and *Myriophyllum spicatum*.
- Native plant species, excluding *Typha* spp. must have an areal cover of at least
  - 70% in saturated tree, shrub, sedge meadow, or wet prairie communities
  - 50% in inundated tree, shrub, or shallow emergent communities
  - 30% in deep emergent communities (average depth > 8 inches)
  - 10% in floating aquatic communities (average depth > 1.5 feet)
- The average density of live individuals of tree and shrub species shall be at least 250 stems per acre. Volunteer tree and shrub species may be counted toward the final tree density.
- No single species shall constitute more than 20 percent of the total.

Stream mitigation must meet the following success criteria for at least two consecutive years:

- The stream banks above the ordinary high water mark and within the 50 foot riparian buffer area will demonstrate a minimum 70 percent native vegetation areal cover.
- The combined surface areal coverage of *Phalaris arundinacea* and *Typha* spp. shall not exceed 15 percent of the stream mitigation.
- The stream buffer must be free of *Lythrum salicaria*, *Phragmites australis*, *Rhamnus frangula*, and *Myriophyllum spicatum*.
- The average density of live individuals of tree and shrub species shall be at least 250 stems per acre. Volunteer tree and shrub species may be counted toward the final tree density.
- No single species shall constitute more than 20 percent of the total.



- At the Prairie Creek mitigation site, a minimum 3,197 feet of stream must be created which exhibits an ordinary high water mark.
- At the Prairie Creek mitigation site, the stream mitigation area must have a minimum 50 foot width per bank forested buffer along the length of 3,197 feet or a total area of 7.20 acres of forested buffer. If average tree diameter/height requirements are not met for a forested community at end of monitoring period, a trend analysis may be used to show that the diameter/height shall be reached with additional development time.
- At the Prairie Creek mitigation site, the created streams shall exhibit stable conditions with minimal head-cutting or bank sloughing. Constructed riffles shall not exhibit extensive embeddedness. Some deviation of the centerline is expected in natural stream development.

## 7.0 Site Protection and Maintenance

### 7.1 Parties Responsible

INDOT, or qualified consultant, will be responsible for the maintenance of the mitigation until release from monitoring is granted by the USACE and IDEM. Ownership of the Site will be maintained by INDOT.

### 7.2 Legal Protection

A copy of a properly recorded deed restriction or conservation easement will be filed, which describes the compensatory mitigation contained in the mitigation plan, with the USACE and IDEM within sixty days of the release from monitoring requirements. This shall provide a legal guarantee to protect the mitigation in perpetuity. The entire Prairie Creek site will be covered under the deed restriction.

### 7.3 Maintenance Plan and Schedule

During the yearly monitoring inspection, or as directed by INDOT, the site will be inspected for the presence of undesirable species in conformance with the success criteria. Recommendations for weed control measures and estimated fees will be provided. Other maintenance activities will be assessed as needed and implemented to meet the success criteria. Maintenance activities may include irrigation and/or hydrologic control adjustment, invasive species removal, supplemental seeding or planting, erosion repair, controlled burns, minor grading, and/or animal depredation deterrent. Signs to prohibit mowing and spraying will be inspected for visibility. All monitoring equipment and hydrologic controls will be inspected and maintained in good working condition and may include activities such as recalibration, clearing sediment, debris, and/or biological growth.

### Invasive Species Management

Please see Section 5.2 for prevention measures. Invasive species typically form expansive monocultural stands and provide minimal habitat value, such as food or shelter. Invasive species will be controlled meticulously so that success criteria will be met. Plant identification will be conducted as part of the scheduled maintenance and monitoring activities. A qualified and experienced scientist will evaluate and execute the most effective method for management of any present invasive species. Only properly licensed personnel with protective clothing should apply herbicide. A list of common invasive species and typical control measures is provided below<sup>3</sup>.

#### *Phragmites Australis* – Common Reed

Description: hollow, rigid, woody stalks one inch diameter and up to 13 feet tall, alternate leaves up to 16 inches long, silky spikelets

Best treatments: Foliar application of systemic herbicide, like glyphosate, during growing season

<sup>3</sup> Aquatic Invasive Species; AIS. [www.in.gov/dnr/invasivespecies](http://www.in.gov/dnr/invasivespecies). July 2, 2007.

*Myriophyllum spicatum* – Eurasian Watermilfoil

Description: Eurasian vs Northern; 12 to 21 pairs of leaflets, limp vs. 5 to 10 pairs of leaflets, rigid

Best treatments: selective herbicide application or habitat alteration such as winter drawdown

*Lythrum salicaria* – Purple Loosestrife

Description: Square stem, whorled or opposite, smooth, downy leaves, pink or purple flower spike

Best treatments: cut flower spikes, biological control with beetles, or broadleaf herbicide application late June to early August

*Phalaris arundinacea* – Reed Canary Grass

Description: up to 9 feet tall hairless stems, gradually tapering leaves up to 10 inches long, leaves typically align along one side of stem

Best treatments: mowing, aggressive herbicide application, burn 3 weeks following herbicide, cultivate after other treatments to deplete seed bank, repeat herbicide application to seedlings

*Rhamnus frangula* – Glossy Buckthorn

Description: shrub or small tree, 1-3 inch oval, wavy, shiny leaves, slightly pubescent, brown-green branches with elongated lenticels, 5 petal white flowers, small round fruit

Best treatments: stump application of glyphosate in August/September or spray application in May/July

*Typha* spp. – Cattail

Description: stem three to nine feet tall terminating in a brown compact spike, long lanceolate leaves originating at base of stem

Best treatments: spring submergence under water, prescribed burning in winter, or glyphosate herbicide application mid to late summer

Plant Replacement and Maintenance

Dead trees and shrubs within 1 year of installation will be replaced under the plant warrantee. After the warrantee expires, plants will be replaced as necessary to meet the minimum required density for mitigation. Trees showing signs of stress will be inspected and an appropriate method of protection or treatment will be used. Pruning will be limited to dead or dying branches and basal shoots. Bare soil will be reseeded or planted with native plugs only when required to meet success criteria or to prevent further erosion.

Erosion Control

Areas of erosion will be assessed and treated with an appropriate form of erosion or sediment control measure.

Herbivore Protection

Damage to trees and shrubs will be monitored and controlled with methods such as tree wrap for deer, exclusion fencing, or application of pesticide for insects.

## **8.0 Monitoring Plan**

### *8.1 Monitoring Schedule*

Monitoring will commence within one growing season of the completion of construction. A minimum of two site inspections will be conducted for monitoring of wetlands and one site inspection for streams during each growing season. The monitoring reports will be submitted to the USACE and IDEM by December 31 of the same year. The wetland mitigation will be monitored every year for a minimum of five years. The stream mitigation will be monitored every year for a minimum of five years. Reports will be submitted to the USACE and IDEM during years one through five or as otherwise stated in the

approved 401 and 404 permits. The mitigation will not be considered complete until the success criteria are reached for at least two consecutive years. Corrective actions will be completed as necessary to ensure that the mitigation will achieve the success criteria within the monitoring period. A wetland delineation will be performed in the final year of monitoring. A delineation report and a request to be released from monitoring will be submitted when the performance standards have been met.

### 8.2 *Parties Responsible*

RW Armstrong, acting as INDOT's agent, will be responsible for monitoring.

Company: RW Armstrong  
 Contact: Summer O'Brien, PWS, Environmental Scientist  
 Address: Union Station, 300 S. Meridian Street  
 Indianapolis, Indiana 46225  
 Phone: 317-780-7182

### 8.3 *Methodology*

The site will be inspected for indicators of mitigation success or failure as described in the success criteria. The monitoring reports will include the following:

- the USACE and IDEM permit number,
- name and contact information of permittee,
- name and contact information of permitting consultant,
- name and contact information of monitoring consultant,
- summary of project purpose, impacts, and mitigation,
- location description and directions,
- maps identifying mitigation, transects, planting zones, and photo locations,
- dates of mitigation construction,
- discussion of whether performance standards are being met,
- maintenance activities conducted,
- recommendations for remedial actions
- reports shall follow requirements of USACE Regulatory Guidance Letter No. 08-03.

In order to accurately assess the success criteria, the Floristic Quality Assessment in Indiana (FQA) (Rothrock 2004), or other similar method, will be used to measure invasive and native species dominance, bare ground areal cover, and water levels/open water of the mitigation site. FQA Transects will be measured through one square meter quadrats taken at regular intervals along representative transects. Percent vegetation coverage per species will be assessed within each quadrat. Hydrology and/or bare ground will also be estimated within each quadrat. Observed species outside of quadrat samples will be recorded for qualitative measure by meandering vegetative survey or FQA Inventory. In addition to the FQA, stream forested areas will be measured for tree/shrub species, diameter, height, and density within 30 foot diameter plots. Enough plots will be recorded to accurately generate site tree densities within each forested mitigation zone. The GPS coordinate may be recorded for each quadrat/plot or the interval of quadrat samples will be noted so that it can be repeated each monitoring year. Photos will be taken of each representative mitigation zone and include positive or negative features developing in the mitigation.

The FQA method will measure the invasive and native species dominance and areal coverage for the mitigation site. These values will be compared to the success criteria to determine mitigation progress and success or failure at the completion of the typical monitoring periods for each habitat type.

### Wetlands

In the final year of monitoring, the wetland boundary will be delineated based on the procedures outlined in the 1987 U.S. Army Corps of Engineers Delineation Manual and all relevant regional supplements and mapped using GPS. Areas of open water and/or upland shall be delineated and mapped to determine actual wetland area. Upland areas and open water areas in excess of 10% of total surface area will be subtracted from wetland area. Not only must the exterior boundaries of the wetland area be delineated, but there must also be information from within the delineated boundaries showing that all the included areas are indeed meeting wetland criteria. This demonstration may be accomplished by referencing the FQA quadrat data.

### Streams

The Field Evaluation Manual for Ohio's Primary Headwater Habitat Streams<sup>iv</sup> and Methods for Assessing Habitat in Flowing Waters: Using the Qualitative Habitat Evaluation Index (QHEI)<sup>v</sup> will be used to measure stream mitigation development at representative locations. The Headwater Habitat Evaluation Index (HHEI) and QHEI data forms will be compared with the applicable success criteria to determine mitigation progress and success or failure at the completion of the monitoring period. At least one HHEI or QHEI will be performed per constructed stream segment. These locations will be marked with T-Posts or the GPS coordinates will be recorded for repeatability and will also serve as photo stations.

## **9.0 Adaptive Management Plan**

### *9.1 Responsible Parties*

INDOT will be responsible for successful mitigation development during the monitoring period as previously discussed in Sections 7.0 and 8.0. Any mitigation failures will be addressed in a timely manner in coordination with the USACE and IDEM. INDOT will be responsible for the long term management and ownership responsibility of the Prairie Creek Mitigation Site and Site 12 mitigation.

### *9.2 Contingency Plan*

A contingency area has been added to the construction in the event that drought, flooding, or other potential disaster negatively impacts the mitigation development. If any constructed mitigation area fails to meet the permit criteria, INDOT will seek use of the contingency area toward meeting the requirements before seeking other remedial measures.

A drainage easement traverses the center of the property along Prairie Creek/McCullough Ditch. Planting of trees or shrubs on the west bank in this 75 foot easement has been avoided in the likelihood that the easement will be maintained. A low flow crossing will be constructed at the confluence of the mitigation stream and existing Prairie Creek/McCullough Ditch so that maintenance vehicles may pass without needing additional reinforcement.

### *9.3 Remedial Measures*

INDOT, or a qualified consultant, shall be responsible for implementing remedial measures. In the event that the Mitigation Site is experiencing conditions unfavorable to mitigation development, the site will be evaluated to determine a corrective action plan. If necessary, INDOT will submit a remediation strategy and schedule to IDEM and the USACE within 60 days of the identification of a problem.

Remedial measures may include grading, supplemental planting, hydrologic adjustment, erosion control, and at the very most, relocation of the mitigation site. In some cases, the mitigation site may only need more time to become successful and additional years of monitoring would be added. Re-design and construction will be contingent upon the cause of failure.

## 10.0 Financial Assurances

### 10.1 Responsible Parties

INDOT will be financially responsible for the mitigation site during the monitoring period. RWA is under contract with INDOT to provide design and monitoring through ten years. At the completion of 10 years of monitoring should any of the mitigation site be deemed unacceptable by the USACE or IDEM, INDOT shall determine liability and seek damages.

---

<sup>i</sup> Mikles, Len. Waters of the US Determination/Wetland Delineation Report for the Proposed Prairie Creek Wetland Mitigation Site (Des. No. 9905500). ASC Group, Inc. April 9, 2010.

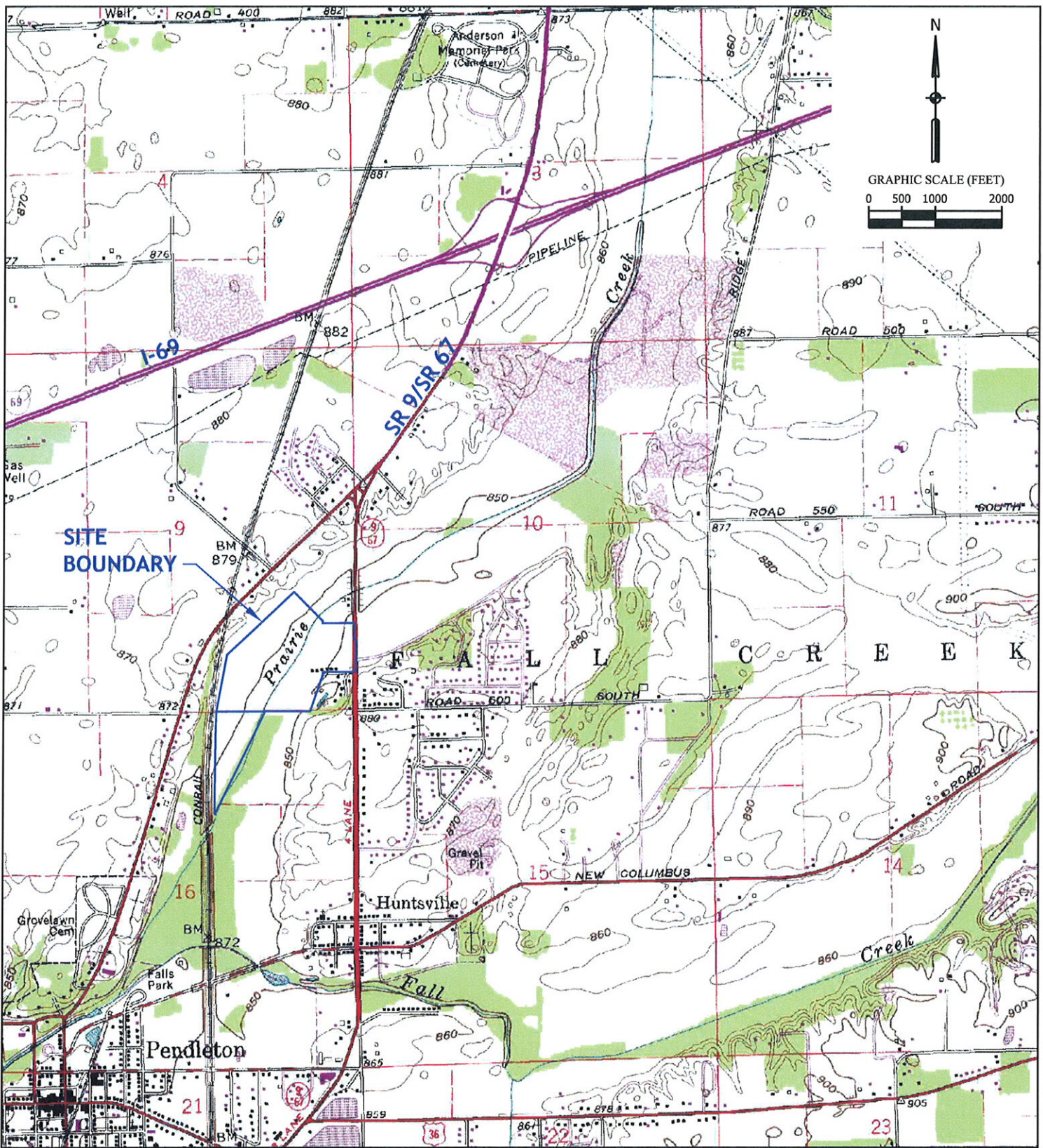
<sup>ii</sup> Snyder, Jim, MA and Nelson, Ross, MA, MS. Phase Ia Survey of the Proposed Prairie Creek Wetland Mitigation Area in Fall Creek Township, Madison County, Indiana. ASC Group, Inc. March 29, 2010.

<sup>iii</sup> Nelson, Ross, MA, MS and Terpstra, Douglas, MS. Historic Property Report for the Prairie Creek Wetland Mitigation Area in Fall Creek Township, Madison County, Indiana. ASC Group, Inc. April 13, 2010.

<sup>iv</sup> 2009. Field Evaluation Manual for Ohio's Primary Headwater Habitat Streams. Review Ver. 2.3. Ohio EPA Division of Surface Water, Columbus, Ohio.

<sup>v</sup> 2006. Methods for Assessing Habitat in Flowing Waters: Using the Qualitative Habitat Evaluation Index (QHEI). OHIO EPA Technical Bulletin EAS/2006-06-1. Ohio EPA Division of Surface Water, Ecological Assessment Section. Groveport, Ohio.





## PRAIRIE CREEK MITIGATION SITE

USGS 7.5 MINUTE QUADRANGLE MAP -ANDERSON SOUTH

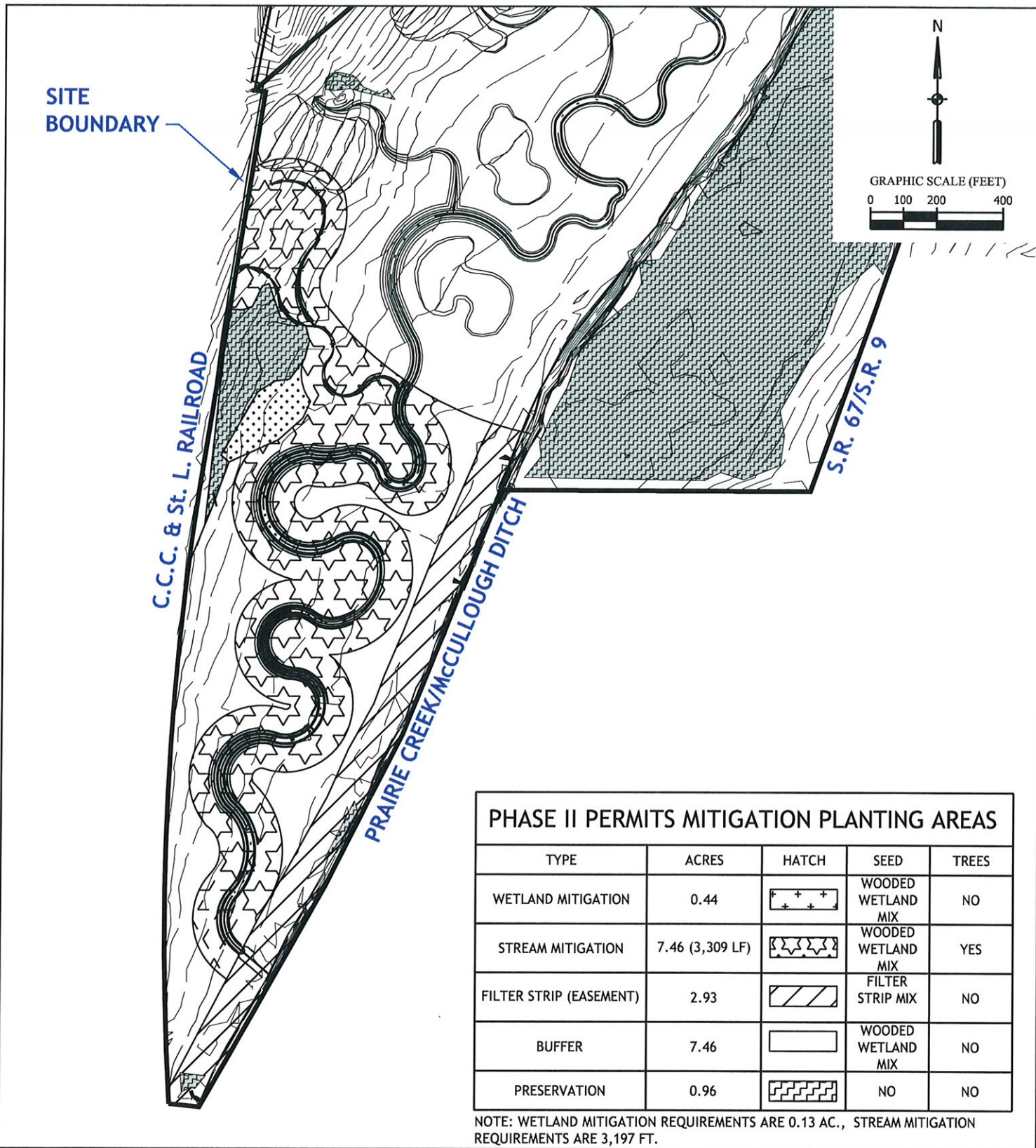
## FIGURE 3: LOCATION MAP



Union Station / 300 S. Meridian St.  
Indianapolis, IN 46225  
PH 317.786.0461 // FX 317.788.0957  
[rwArmstrong.com](http://rwArmstrong.com)



File Name: P:\Transportation\2007\1350 US31 Hamilton\68 Permits\401-404 permit documents\mitigation search\Pending\Maps\MMP-PHII-MAP.dwg  
Modified / By: December 17, 2010 9:57:47 AM / sobrien - corps



Union Station / 300 S. Meridian St.  
Indianapolis, IN 46225  
PH 317.786.0461 // FX 317.788.0957  
[rwArmstrong.com](http://rwArmstrong.com)

## PRAIRIE CREEK MITIGATION SITE

### STREAM AND WETLAND MITIGATION PLAN

## FIGURE 4: PLANTING PLAN





File Name: P:\Transportation\2007\350 US31 Hamilton\68 Permits\401-404 permit documents\mitigation search\Pendleton\Maps\NWI-MAP.dwg  
 Modified / By: November 3, 2009 12:51:55 PM / eodrien



Union Station / 300 S. Meridian St.  
 Indianapolis, IN 46225  
 PH 317.786.0461 // FX 317.788.0957  
[rwArmstrong.com](http://rwArmstrong.com)

## PRAIRIE CREEK MITIGATION SITE

2005 AERIAL PHOTOGRAPHY - USFWS

# NATIONAL WETLANDS INVENTORY MAP